Claims

What is claimed is:

1. A method of mitigating interference effects under a communication environment including a first spread spectrum (SS) transmission scheme and a second spread spectrum (SS) transmission scheme in the same frequency band, comprising the steps of:

(1.1) responsive to received signal, outputting number of signals of the first SS transmission scheme, and outputting number of signals of the second SS transmission scheme;

(1.2) obtaining a timing information of signals of the first SS transmission scheme and the second SS transmission scheme, wherein

(1.2a) obtaining the timing information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

(1.2b) obtaining the timing information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

(1.3) generating a plurality of linearly-modulated signals;

(1.4) correlating the received signal based on the plurality of linearly-modulated signals to generate correlated outputs; and

(1.5) selectively producing an estimated information sequence carried by the signals of the first SS transmission scheme and the signals of the second SS transmission scheme based on the correlated outputs.

2. The method of Claim 1, wherein the first SS transmission scheme is Direct Sequence Spread Spectrum (DSSS).

3. The method of Claim 2, wherein between the step (1.1) and the step (1.2) further

comprises the step of

identifying an employed spreading waveform of signals of DSSS in the received signal.

4. The method of Claim 1, wherein the second SS transmission scheme is Frequency Hopping Spread Spectrum (FHSS).

5. The Method of Claim 4, wherein between the step (1.1) and step (1.2) further comprises the step of

detecting the hopping frequency of signals of FHSS in the received signal.

6. The method of Claim 1, wherein, in the step $(1.2)_2$ the step of obtaining the timing information of signals of second SS transmission scheme comprises the step of:

assuming the timing of signals of the second SS transmission scheme in the received signal equal to the timing of signals of the first SS transmission scheme.

7. The method of Claim 6, further comprises the steps of:

(7.1) obtaining a phase information of signals of the first SS transmission scheme transmission scheme in the received signal; and

(7.2) obtaining a phase of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

8. The method of Claim 6, further comprises the steps of:

(8.1) obtaining an amplitude information of signals of the first SS transmission scheme in the received signal; and

(8.2) obtaining an amplitude information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

9 The method of Claim 6, further comprises the steps of:

(9.1) selectively outputting a chosen signal with a time delay in the first and the second SS transmission scheme, wherein the time delay is determined by the timing information of the first and the second SS transmission scheme;

(9.2) calculating combination coefficients based on the timing information of the first and the second SS transmission scheme;

(9.3) correlating the received signal with the chosen signal to produce correlating outputs;

(9.4) linearly combining the correlating outputs using the combination coefficients;

(9.5) obtaining a phase and amplitude of the chosen signal using the linear combination output.

10. The method of Claim 1, wherein the step (1.2) comprises the step of:

obtaining the timing information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

11. The method of Claim 1, wherein between the step (1.2) and step (1.3) further comprises the step of:

obtaining a phase information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

12. The method of Claim 1, wherein between the step (1.2) and step (1.3) further comprises the step of:

obtaining an amplitude information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

13. The method of Claim 1, wherein between the step (1.2) and step (1.3) further comprises the step of:

(13.1) obtaining a phase information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

(13.2) obtaining a phase information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

14. The method of Claim 1, wherein between the step (1.2) and step (1.3) further comprises the step of:

(14.1) obtaining an amplitude information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

(14.2) obtaining an amplitude information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

15. The method of Claim 1, wherein between the step (1.2) and step (1.3) further comprises the step of:

(15.1) obtaining a phase and amplitude information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

(15.2) obtaining the phase and amplitude information of signals of the second SS transmission scheme in the received signal using the timing, phase and amplitude information of signals of the first SS transmission scheme.

16. The method of Claim 1, wherein the step (1.2) comprises the steps of:

(16.1) when one signal of the first SS transmission scheme in the received signal is detected after a predetermined time t2, peeking other frequency bands to obtain a first timing information of signals of the first SS transmission scheme in the received

signal, wherein the other frequency bands refers to frequency bands that contain the signals of the first SS transmission scheme;

(16.2) when one signal of the first SS transmission scheme in the received signal is detected before the predetermined time t2, obtaining a second timing information of signals of the first SS transmission scheme in the received signal; and

(16.3) obtaining a timing information of signals of the second SS transmission scheme in the received signal using the first and the second timing information of the signals of the first SS transmission scheme.

17. The method of Claim 13, wherein further comprises the steps of:

(17.1) when one signal of the first SS transmission scheme in the received signal is detected after a predetermined time t2, peeking other frequency bands to obtain a first timing and phase information of signals of the first SS transmission scheme in the received signal, wherein the other frequency bands refers to frequency bands that contain the signals of the first SS transmission scheme;

(17.2) when one signal of the first SS transmission scheme in the received signal is detected before the predetermined time t2, obtaining a second timing and phase information of signals of the first SS transmission scheme in the received signal; and

(17.3) obtaining the timing and phase information of signals of the second SS transmission scheme in the received signal using the first and the second timing and phase information of the signals of the first SS transmission scheme.

18. The method of Claim 14, wherein further comprises the steps of:

(18.1) when one signal of the first SS transmission scheme in the received signal is detected after a predetermined time t2, peeking other frequency bands to obtain a first timing and amplitude information of signals of the first SS transmission scheme in the received signal, wherein the other frequency bands refers to frequency bands that

contain the signals of the first SS transmission scheme;

(18.2) when one signal of the first SS transmission scheme in the received signal is detected before the predetermined time t2, obtaining a second timing and amplitude information of signals of the first SS transmission scheme in the received signal; and

(18.3) obtaining the timing and amplitude information of signals of the second SS transmission scheme in the received signal using the first and the second timing and amplitude information of the signals of the first SS transmission scheme.

19. The method of Claim 15, wherein further comprises the steps of:

(19.1) when one signals of the first SS transmission scheme in the received signal is detected after a predetermined time t2, peeking other frequency bands to obtain a first timing, phase and amplitude information of signals of the first SS transmission scheme in the received signal, wherein the other frequency bands refers to frequency bands that contain the signals of the first SS transmission scheme;

(19.2) when one signal of the first SS transmission scheme in the received signal is detected before the predetermined time t2, obtaining a second timing, phase and amplitude information of signals of the first SS transmission scheme in the received signal; and

(19.3) obtaining the timing phase, and amplitude information of signals of the second SS transmission scheme in the received signal using the first and the second timing, phase and amplitude information of the signals of the first SS transmission scheme.

20. The method of Claim 1 or 16, wherein the step of obtaining the timing information of signals of the second SS transmission scheme comprises the steps of:

200. performing the following steps for M times:

(200.1) assuming an initial received timing estimate τ of signals of the second SS transmission scheme in the received signal;

(200.2) calculating an intermediate timing of signals of the second SS transmission

scheme in the received signal using the timing information of signals of the first SS transmission scheme in the received signal and the initial received timing estimation τ;

(200.3) obtaining an intermediate phase, amplitude of signals of the second SS transmission scheme in the received signal based on the intermediate timing;

201. obtaining the timing, phase and amplitude information of signals of the second SS transmission scheme by averaging the intermediate timings, phases and amplitudes obtained in step 200 by M.

21. The method of Claim 15 or 19, wherein the step of obtaining the timing, phase and amplitude information of signals of the second SS transmission scheme comprises the steps of:

210. performing the following steps for M times:

(210.1) assuming an initial received timing estimation τ of signals of the second SS transmission scheme in the received signal;

(210.2) calculating an intermediate timing of signals of the second SS transmission scheme in the received signal using the timing, phase and amplitude information of signals of the first SS transmission scheme in the received signal and the initial received timing estimation τ;

(210.3) obtaining an intermediate phase, amplitude of signals of the second SS transmission scheme in the received signal based on the intermediate timing;

211. obtaining the timing, phase and amplitude information of signals of the second SS transmission scheme by averaging the intermediate timings, phases and amplitudes obtained in step 210 by M.

22. A method of mitigating interference effects under a communication environment including a Direct Sequence Spread Spectrum (DSSS) signal and a Frequency Hopping Spread Spectrum (FHSS) signal in the same frequency band, comprising the steps of:

(22.1) responsive to a received signal, outputting number and spreading waveform of the DSSS signals, and outputting number and hopping frequencies of the FHSS signals;

(22.2) obtaining timings of the DSSS signals and the FHSS signals;

(22.3) if the DSSS signals and the FHSS signals are linearly-modulated, outputting a plurality of linearly-modulated signals based on a predetermined manner;

(22.4) correlating the received signal based on the following steps:

(22.4a) calculating a combination coefficient using the timing information of the FHSS signals and the DSSS signals;

(22.4b) correlating the received signal with DSSS signal;

(22.4c) using a FHSS signal in the plurality of linearly-modulated to produce a FHSS signal with time delay, wherein the time delay is determined by received timings of the FHSS signals.

(22.4d) correlating the received signal with the FHSS signal with time-delay.

(22.4e) generating linear combination outputs based on step (22.4a)、step (22.4b) and step (22.4d); and

(22.5) selectively producing an estimated information sequence carried by the DSSS signals and the FHSS signals based on the linear combination outputs.

23. The method of Claim 22, wherein the predetermined manner in the step (22.3) comprising:

(23.1) if the DSSS and FHSS signals are asynchronous, performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-t), \text{ for } t \text{ in } [0, t] \\ 0, \text{ otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-t), \text{ for } t \text{ in } [t, T] \\ 0, \text{otherwise} \end{cases}$$

wherein $S_k(t)$ is a FHSS or DSSS signal having a duration of T;

(23.2) outputting a plurality of linearly-modulated signals based on the above equation;

(23.3) if the DSSS and the FHSS signals are synchronous, outputting the DSSS signals and the FHSS signals as a plurality of linearly-modulated signals;

24. A method of mitigating interference effects under a communication environment including a Frequency Hopping Spread Spectrum (FHSS) signal and a Frequency Hopping Spread Spectrum (FHSS) signal in the same frequency band, comprising the steps of:

(24.1) responsive to a received signal, outputting number and hopping frequencies of the FHSS signals;

(24.2) obtaining timings of the FHSS signals;

(24.3) if the FHSS signals are linearly-modulated, outputting a plurality of linearly-modulated signals based on a predetermined manner;

(24.4) correlating the received signal based on the following steps:

(23.4a) calculating a combination coefficient using the timing information of the FHSS signals;

(23.4b) using a FHSS signal in the plurality of linearly-modulated to produce a FHSS signal with time delay, wherein the time delay is determined by received timings of the FHSS signals.

(23.4c) correlating the received signal with the FHSS signal with time-delay.

(23.4d) generating linear combination outputs based on step (23.4a) and step (23.4c); and

(24.5) selectively producing an estimated information sequence carried by the DSSS signals and the FHSS signals based on the linear combination outputs.

25. The method of Claim 24, wherein the predetermined manner in step (24.3) comprising:

(25.1) if the FHSS signals are asynchronous, performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-\tau), \text{for } t \text{ in } [0, \tau] \\ 0, \text{otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-\tau), \text{for } t \text{ in } [\tau, T] \\ 0, \text{otherwise} \end{cases}$$

wherein $S_n(t)$ is a FHSS signal having a duration of T;

(25.2) outputting a plurality of linearly-modulated signals based on the above equation;

(25.3) if the FHSS signals are synchronous, outputting the FHSS signals as a plurality of linearly-modulated signals;

26. A method of mitigating interference effects under a communication environment including a first spread spectrum (SS) transmission scheme and a second spread spectrum (SS) transmission scheme in the same frequency band, comprising the steps of:

(26.1) responsive to received signal, outputting number of signals of the first SS transmission scheme, and outputting number of signals of the second SS transmission scheme;

(26.2) obtaining a timing information of signals of the first SS transmission scheme and the second SS transmission scheme

(26.3) if a signal of the first SS transmission scheme and the second SS transmission scheme is non-linearly-modulated, wherein

(26.3a) producing a first plurality of linearly-modulated signals by constructing extra signals to the signals of the first and the second SS transmission scheme; and

(26.3b) generating a plurality of linearly-modulated signals using the first plurality of linearly-modulated signals in a predetermined manner.

(26.4) correlating the received signal based on the plurality of linearly-modulated signals to generate a correlated outputs; and

(26.5) selectively producing an estimated information sequence carried by the signals of the first and the second SS transmission scheme based on the correlated outputs.

27. The method of Claim 26, wherein the first SS transmission scheme is Direct Sequence Spread Spectrum (DSSS).

28. The method of Claim 27, wherein between the step (26.1) and the step (26.2) further comprises the step of

identifying an employed spreading waveform of signals of DSSS in the received

signal.

29. The method of Claim 26, wherein the second SS transmission scheme is Frequency Hopping Spread Spectrum (FHSS).

30. The Method of Claim 29, wherein between the step (26.1) and step (26.2) further comprises the step of

detecting the hopping frequency of signals of FHSS in the received signal.

31. The method of Claim 26, wherein the predetermined step in (26.3) comprising:

(31.1) if the first plurality of linearly-modulated signals are asynchronous, performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-\tau), \text{ for } t \text{ in } [0, \tau] \\ 0, \text{ otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-\tau), \text{ for } t \text{ in } [\tau, T] \\ 0, \text{ otherwise} \end{cases}$$

wherein $S_k(t)$ is a signal of the first or the second SS transmission scheme in the first plurality of linearly-modulated signals having a duration of T;

(31.2) outputting a plurality of linearly-modulated signals based on the above equation;

(31.3) if the first plurality of linearly-modulated signals are synchronous, outputting the first plurality of linearly-modulated signals as a plurality of linearly-modulated signals;

32. The method of Claim 26, wherein the step (26.5) comprising:

if a signal in the first and the second SS transmission scheme is non-linearly-modulated, wherein the estimated information sequence is carried by the signal, performing the following steps:

(32.1) finding a first linear combination of the correlated outputs using a combination

coefficients, wherein the combination coefficients are calculated using the timings of the signals of the first and the second SS transmission scheme;

(32.2) finding a second linear combination of the correlated outputs using the combination coefficients;

(32.3) finding a difference of absolute value between the first combination and the second combination of the correlated outputs; and

(32.4) performing sign test to the difference of absolute value.

33. A method of mitigating interference effects under a communication environment including a first Direct Sequence Spread Spectrum (DSSS) signal and a second Direct Sequence Spread Spectrum (SS) signal coexisting in the same frequency band, comprising the steps of:

(33.1) responsive to received signal, outputting number and spreading waveform of the DSSS signals;

(33.2) obtaining a timing information of signal of the first DSSS signal and the second DSSS signal, wherein

(33.2a) obtaining the timing information of the first DSSS signal in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

(33.2b) obtaining the timing information of the second DSSS signal in the received signal using the timing information of the first DSSS signal.

(33.3) generating a plurality of linearly-modulated signals;

(33.4) correlating the received signal based on the plurality of linearly-modulated signals to generate correlated outputs; and

(33.5) selectively producing an estimated information sequence carried by the first DSSS signal and the second DSSS signal based on the correlated outputs.

34. A system for mitigating interference effects under a communication environment including a first spread spectrum (SS) transmission scheme and a second spread spectrum (SS) transmission scheme in the same frequency band, comprising:

an identification means, responsive to received signal, for outputting number of signals of the first SS transmission scheme, and outputting number of signals of the second SS transmission scheme;

a synchronization means for obtaining a timing information of signals of the first SS transmission scheme and the second SS transmission scheme, comprising

a first means for obtaining the timing information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

a second means for obtaining the timing information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme;

a generation means for generating a plurality of linearly-modulated signals;

a detection means for correlating the received signal based on the plurality of linearly-modulated signals to generate correlated outputs and selectively producing an estimated information sequence carried by the signals of the first SS transmission scheme and the signals of the second SS transmission scheme based on the correlated outputs.

35. The system of Claim 34, wherein the first SS transmission scheme is Direct

Sequence Spread Spectrum (DSSS).

36. The system of Claim 35, wherein the identification means further identifies an employed spreading waveform of signals of DSSS in the received signal.

37. The system of Claim 34, wherein the second SS transmission scheme is Frequency Hopping Spread Spectrum (FHSS).

38. The system of Claim 37, wherein the identification means further detects the hopping frequency of signals of FHSS in the received signal.

39. The system of Claim 34, wherein the synchronization means comprises:
a third means for assuming the timing of signals of the second SS transmission scheme in the received signal equal to the timing of signals of the first SS transmission scheme.

40. The system of Claim 39, wherein,

the first means further obtains a phase information of signals of the first SS transmission scheme transmission scheme in the received signal; and

the second means further obtains a phase of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

41. The system of Claim 39, wherein,

the first means further obtains an amplitude information of signals of the first SS transmission scheme in the received signal; and

the second means further obtains an amplitude information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

42. The system of Claim 39, wherein the synchronization means further comprises:

a fourth means for selectively outputting a chosen signal with a time delay in the first and the second SS transmission scheme, wherein the time delay is determined by the timing information of the first and the second SS transmission scheme;

a fifth means for calculating combination coefficients based on the timing information of the first and the second SS transmission scheme;

a sixth means for correlating the received signal with the chosen signal to produce correlating outputs;

a seventh means for linearly combining the correlating outputs using the combination coefficients;

an eighth means for obtaining a phase and amplitude of the chosen signal using the linear combination output.

43. The system of Claim 34, wherein the second means further obtains the timing

information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

44. The system of Claim 34, wherein the second means further obtains a phase information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

45. The system of Claim 34, wherein the second means further obtains an amplitude information of signals of the second SS transmission scheme in the received signal when there is no signal of the first SS transmission scheme is detected after the predetermined time t1.

46. The system of Claim 34, wherein the first means further obtains a phase information of signals of the first SS transmission scheme in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

the second means further obtains a phase information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

47. The system of Claim 34, wherein the first means further selectively obtains an amplitude information of signals of the first SS transmission scheme in the received signal;

the second means further selectively obtains an amplitude information of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme.

48. The system of Claim 34, wherein the first means further selectively obtains a phase and amplitude information of signals of the first SS transmission scheme in the received signal;

the second means further obtains the phase and amplitude information of signals of the second SS transmission scheme in the received signal using the timing, phase and amplitude information of signals of the first SS transmission scheme.

49. The system of Claim 34, wherein the first means further selectively peeking other frequency bands to obtain a first timing information of signals of the first SS transmission scheme in the received signal; and further selectively obtains a second timing information of signals of the first SS transmission scheme in the received signal;

the second means further selectively obtains a timing information of signals of the second SS transmission scheme in the received signal using the first and the second timing information of the signals of the first SS transmission scheme.

50. The system of Claim 34, wherein the first means further selectively peeks other frequency bands to obtain a first timing and phase information of signals of the first SS transmission scheme in the received signal; and further selectively obtains a

second timing and phase information of signals of the first SS transmission scheme in the received signal;

the second means further obtains the timing and phase information of signals of the second SS transmission scheme in the received signal using the first and the second timing and phase information of the signals of the first SS transmission scheme.

51. The system of Claim 34, wherein the first means further selectively peeks other frequency bands to obtain a first timing and amplitude information of signals of the first SS transmission scheme in the received signal; and further selectively obtains a second timing and amplitude information of signals of the first SS transmission scheme in the received signal;

the second means further selectively obtains the timing and amplitude information of signals of the second SS transmission scheme in the received signal using the first and the second timing and amplitude information of the signals of the first SS transmission scheme.

52. The system of Claim 34, wherein the first means further selectively peeks other frequency bands to obtain a first timing, phase and amplitude information of signals of the first SS transmission scheme in the received signal; and further selectively obtains a second timing, phase and amplitude information of signals of the first SS transmission scheme in the received signal;

the second means further selectively obtaining the timing phase, and amplitude information of signals of the second SS transmission scheme in the received signal

using the first and the second timing, phase and amplitude information of the signals of the first SS transmission scheme.

53. The system of Claim 34, wherein the second means comprises

a repeating means for performing the following steps for M times:

(530.1) assuming an initial received timing estimate τ of signals of the second SS transmission scheme in the received signal;
(530.2) calculating an intermediate timing of signals of the second SS transmission scheme in the received signal using the timing information of signals of the first SS transmission scheme in the received signal and the initial received timing estimation τ;
(530.3) obtaining an intermediate phase, amplitude of signals of the second SS transmission scheme in the received signal based on the intermediate timing; and

an averaging means for obtaining the timing, phase and amplitude information of signals of the second SS transmission scheme by averaging the intermediate timings, phases and amplitudes obtained in the repeating means by M.

54. A system for mitigating interference effects under a communication environment including a Direct Sequence Spread Spectrum (DSSS) signal and a Frequency Hopping Spread Spectrum (FHSS) signal in the same frequency band, comprising:

an identification means, responsive to a received signal, for outputting number and spreading waveform of the DSSS signals, and outputting number and hopping frequencies of the FHSS signals;

a synchronization means for obtaining timings of the DSSS signals and the FHSS signals;

a construction means for selectively outputting a plurality of linearly-modulated signals;

a calculation means for calculating combination coefficients using the timing information of the DSSS signal and the FHSS signal;

a detection means for correlating the received signal , comprising:

a first means for correlating the received signal with DSSS signal;

a second means for using a FHSS signal in the plurality of linearly-modulated to produce a FHSS signal with time delay, wherein the time delay is determined by received timings of the FHSS signals.

a third means for correlating the received signal with the FHSS signal with time-delay.

a fourth means for generating linear combination outputs;

a fifth means for selectively producing an estimated information sequence carried by the DSSS signals and the FHSS signals based on the linear combination outputs.

55. The system of Claim 54, wherein the construction means comprises:

a first means for selectively performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-\tau), \text{for } t \text{ in } [0, \tau] \\ 0, \text{ otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-\tau), \text{for } t \text{ in } [\tau, T] \\ 0, \text{otherwise} \end{cases}$$

wherein $S_k(t)$ is a FHSS or DSSS signal having a duration of T;

a second means for outputting a plurality of linearly-modulated signals;

a third means for selectively outputting the DSSS signals and the FHSS signals as a plurality of linearly-modulated signals;

56. A system of mitigating interference effects under a communication environment including a Frequency Hopping Spread Spectrum (FHSS) signal and a Frequency Hopping Spread Spectrum (FHSS) signal in the same frequency band, comprising:

an identification means, responsive to a received signal, for outputting number and hopping frequencies of the FHSS signals;

a synchronization means for obtaining timings of the FHSS signals;

a construction means for selectively outputting a plurality of linearly-modulated signals;

a calculating means for calculating a combination coefficient using the timing information of the FHSS signals;

a detection means for correlating the received signal, comprising:

a first means for using a FHSS signal in the plurality of linearly-modulated to produce a FHSS signal with time delay, wherein the time delay is determined by received timings of the FHSS signals;

a second means for correlating the received signal with the FHSS signal with time-delay;

a third means for generating linear combination outputs;

a fourth means for selectively producing an estimated information sequence carried by the DSSS signals and the FHSS signals based on the linear combination outputs.

57. The method of Claim 56, wherein the construction means comprising:

a first means for selectively performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-t), \text{ for } t \text{ in } [0, t] \\ 0, \text{ otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-t), \text{for } t \text{ in } [t, T] \\ 0, \text{otherwise} \end{cases}$$

wherein $S_k(t)$ is a FHSS signal having a duration of T;

a second means for outputting a plurality of linearly-modulated signals based on the above equation;

a third means for selectively outputting the FHSS signals as a plurality of linearly-modulated signals;

58. A system of mitigating interference effects under a communication environment including a first spread spectrum (SS) transmission scheme and a second spread spectrum (SS) transmission scheme in the same frequency band, comprising:

an identification means, responsive to received signal, for outputting number of signals of the first SS transmission scheme, and outputting number of signals of the second SS transmission scheme;

a synchronization means for obtaining a timing information of signals of the first SS transmission scheme and the second SS transmission scheme

a construction means for selectively generating a plurality linearly-modulated signals, comprising

a first means for producing a first plurality of linearly-modulated signals by constructing extra signals to the signals of the first and the second SS transmission scheme; and

a second means for generating a plurality of linearly-modulated signals using the first plurality of linearly-modulated signals; and

a detection means for correlating the received signal based on the plurality of linearly-modulated signals to generate a correlated outputs; and selectively producing an estimated information sequence carried by the signals of the first and the second SS transmission scheme based on the correlated outputs

59. The system of Claim 58, wherein the first SS transmission scheme is Direct Sequence Spread Spectrum (DSSS).

60. The system of Claim 58, wherein the identification means further identifies an employed spreading waveform of signals of DSSS in the received signal.

61. The system of Claim 58, wherein the second SS transmission scheme is Frequency Hopping Spread Spectrum (FHSS).

62. The system of Claim 61, wherein the identification means further detects the hopping frequency of signals of FHSS in the received signal.

63. The method of Claim 58, wherein the construction means comprises;

a third means for selectively performing the following equation:

splitting $S_k(t-\tau)$ into $S_k(t-\tau)$ into $Sk^{(0)}(t)=\begin{cases} =Sk(t+T-\tau), \text{for } t \text{ in } [0, t] \\ 0, \text{ otherwise} \end{cases}$

$$Sk^{(1)}(t)=\begin{cases} =Sk(t-\tau), \text{for } t \text{ in } [t, T] \\ 0, \text{otherwise} \end{cases}$$

wherein $S_k(t)$ is a signal of the first or the second SS transmission scheme in the first plurality of linearly-modulated signals having a duration of T;

a fourth means for outputting a plurality of linearly-modulated signals based on the above equation;

the first means for further selectively outputting the first plurality of linearly-

modulated signals as a plurality of linearly-modulated signals;

64. The system of Claim 58, wherein the detection means further selectively performs the following steps:

(64.1) finding a first linear combination of the correlated outputs using a combination coefficients, wherein the combination coefficients are calculated using the timings of the signals of the first and the second SS transmission scheme;

(64.2) finding a second linear combination of the correlated outputs using the combination coefficients;

(64.3) finding a difference of absolute value between the first combination and the second combination of the correlated outputs; and

(64.4) performing sign test to the difference of absolute value.

65. The system of Claim 58, wherein the detection means further selectively performs the following steps:

(65.1) finding a linear combination of the correlated outputs using combination coefficients, wherein the combination coefficients are calculated using the timings of the signals of the first and second SS transmission scheme; and

(65.2) selectively producing an estimated information sequence carried by the signal by using the linear combination outputs.

66. A system for mitigating interference effects under a communication environment including a first Direct Sequence Spread Spectrum (DSSS) signal and a second Direct Sequence Spread Spectrum (SS) signal coexisting in the same frequency band, comprising:

an identification means, responsive to received signal, for outputting number and spreading waveform of the DSSS signals;

a synchronization means for obtaining a timing information of signal of the first DSSS signal and the second DSSS signal, comprising

a first means for obtaining the timing information of the first DSSS signal in the received signal when one signal of the first SS transmission scheme is detected before a predetermined time t1; and

a second means for obtaining the timing information of the second DSSS signal in the received signal using the timing information of the first DSSS signal.

a generation means for generating a plurality of linearly-modulated signals;

a detection means for correlating the received signal based on the plurality of linearly-modulated signals to generate correlated outputs; and selectively producing an estimated information sequence carried by the first DSSS signal and the second DSSS signal based on the correlated outputs.

67. The method of Claim 26, wherein the step (26.5) comprising:
if a signal in the first and the second SS transmission scheme is linearly modulated, wherein the estimated information sequence is carried by the signal,

performing the following steps:

(67.1) finding a linear combination of the correlated outputs using combination coefficients, wherein the combination coefficients are calculated using the timings of the signals of the first and second SS transmission scheme;

(67.2) selectively producing an estimated information sequence carried by the signal by using the linear combination outputs.